

What is claimed is:

1 1. A reduced size TM cylindrical shaped microstrip antenna
2 array comprising:

3 (a) a first dielectric layer

4 (b) a plurality of rectangular shaped antenna elements
5 mounted on an upper surface of said first dielectric
6 layer, said antenna elements being aligned with one
7 another and fabricated from copper, said antenna elements
8 being adapted to transmit RF carrier signals containing
9 telemetry data;

10 (c) a copper cross hatch pattern mounted on the upper
11 surface of said first dielectric layer around a periphery
12 for each of said antenna elements wherein a gap forms
13 between first, second and third edges of the periphery of
14 each of said antenna elements and said copper cross hatch
15 pattern;

16 (d) an antenna feed network mounted on a bottom surface of
17 said first dielectric layer for connecting each of said
18 antenna elements to an antenna feed network input
19 terminal, said antenna feed network including a plurality
20 of transmission lines configured to provide for an equal
21 transmission line length from said antenna feed network
22 input terminal to each of said antenna elements such that
23 the RF carrier signals transmitted by each of said antenna

elements are in phase and have equal amplitudes;

(e) a band stop filter integrally formed with said antenna feed network on the bottom surface of said first dielectric layer, said band stop filter providing for a minimum band-stop rejection of 60 decibels to isolate said RF carrier signals containing telemetry data from L-Band Radio Frequency signals containing GPS data.

(f) a second dielectric layer positioned below said first dielectric layer in alignment with said first dielectric layer; and

(g) a solid copper ground plane affixed to a bottom surface of said first dielectric layer.

2. The TM cylindrical shaped microstrip antenna of claim 1 wherein said plurality of transmission lines for said antenna feed network includes a main transmission line connected to said antenna feed network input terminal and a plurality of branch transmission lines, each of said branch transmission lines having one end thereof connected to one of said antenna elements and an opposite end thereof connected to said main transmission line.

3. The TM cylindrical shaped microstrip antenna of claim 2 wherein said band-stop filter includes six etched copper open

3 circuit stubs connected to said main transmission line, three
4 of said six etched copper open circuit stubs being positioned
5 on one side of said main transmission line in proximity to said
6 antenna feed network input terminal and a remaining three of
7 said six etched copper open circuit stubs being positioned on
8 an opposite side said main transmission line in proximity to
9 said antenna feed network input terminal.

1 4. The TM cylindrical shaped microstrip antenna of claim 3
2 wherein each of said six etched copper open circuit stubs has
3 an L shape, each of said six etched copper open circuit stubs
4 operating as a short circuit within a bandwidth for said band-
5 stop filter.

1 5. The TM cylindrical shaped microstrip antenna of claim 1
2 wherein said TM cylindrical shaped microstrip antenna operates
3 at a TM frequency band of 2200-2300 MHz, resulting in a band
4 width for said TM cylindrical shaped microstrip antenna of 100
5 MHz.

1 6. The TM cylindrical shaped microstrip antenna of claim 1
2 wherein said plurality of rectangular shaped antenna elements
3 comprises eight rectangular shape microstrip antenna elements.

1 7. The TM cylindrical shaped microstrip antenna of claim 1
2 wherein said band-stop filter provides said minimum band-stop
3 rejection of 60 decibels at frequencies approximating 1575 MHz.

1 8. The TM cylindrical shaped microstrip antenna of claim 1
2 further comprising a plurality of copper plated through holes
3 positioned within said first dielectric layer and a plurality
4 of plated through holes positioned within said second
5 dielectric layer, the copper plated through holes of said first
6 dielectric layer aligning with the copper plated through holes
7 of said second dielectric layer, the copper plated through
8 holes of said first dielectric layer being EM coupled to the
9 copper plated through holes of said second dielectric layer,
10 wherein the copper plated through holes of said first
11 dielectric layer and the copper plated through holes of said
12 second dielectric layer prevent said antenna feed network from
13 becoming coupled to said antenna elements.

1 9. The TM cylindrical shaped microstrip antenna array of
2 claim 1 wherein the copper plated through holes of said first
3 dielectric layer and the copper plated through holes of said
4 second dielectric layer each comprise approximately 270 copper
5 plated through holes.

1 10. A reduced size TM cylindrical shaped microstrip
2 antenna array comprising:

3 (a) a first dielectric layer

4 (b) a plurality of rectangular shaped antenna elements
5 mounted on an upper surface of said first dielectric
6 layer, said antenna elements being aligned with one
7 another and fabricated from copper, said antenna elements
8 being adapted to transmit RF carrier signals containing
9 telemetry data, said antenna elements operating at a TM
10 frequency band of 2200-2300 MHz, resulting in a band width
11 for said TM cylindrical shaped microstrip antenna of 100
12 MHz;

13 (c) a copper cross hatch pattern mounted on the upper
14 surface of said first dielectric layer around a periphery
15 for each of said antenna elements wherein a gap forms
16 between first, second and third edges of the periphery of
17 each of said antenna elements and said copper cross hatch
18 pattern;

19 (d) an antenna feed network mounted on a bottom surface of
20 said first dielectric layer for connecting each of said
21 antenna elements to an antenna feed network input
22 terminal, said antenna feed network including a plurality
23 of transmission lines configured to provide for an equal
24 transmission line length from said antenna feed network

25 input terminal to each of said antenna elements such that
26 the RF carrier signals transmitted by each of said antenna
27 elements are in phase and have equal amplitudes, wherein
28 said plurality of transmission lines for said antenna feed
29 network includes a main transmission line connected to
30 said antenna feed network input terminal and a plurality
31 of branch transmission lines, each of said branch
32 transmission lines having one end thereof connected to one
33 of said antenna elements and an opposite end thereof
34 connected to said main transmission line;

35 (e) a band stop filter integrally formed with said antenna
36 feed network on the bottom surface of said first
37 dielectric layer, said band-stop filter including a
38 plurality of etched copper open circuit stubs connected to
39 said main transmission line, said band stop filter
40 providing for a minimum band-stop rejection of 60 decibels
41 to isolate said RF carrier signals containing telemetry
42 data from L-Band Radio Frequency signals containing GPS
43 data;

44 (f) a second dielectric layer positioned below said first
45 dielectric layer in alignment with said first dielectric
46 layer; and

47 (g) a solid copper ground plane affixed to a bottom
48 surface of said first dielectric layer.

1 11. The TM cylindrical shaped microstrip antenna of claim
2 10 wherein said plurality of etched copper open circuit stubs
3 comprises six etched copper open circuit stubs connected to
4 said main transmission line, three of said six etched copper
5 open circuit stubs being positioned on one side of said main
6 transmission line in proximity to said antenna feed network
7 input terminal and a remaining three of said six etched copper
8 open circuit stubs being positioned on an opposite side said
9 main transmission line in proximity to said antenna feed
10 network input terminal.

1 12. The TM cylindrical shaped microstrip antenna of claim
2 10 wherein each of said plurality of etched copper open circuit
3 stubs has an L shape, each of said plurality of etched copper
4 open circuit stubs operating as a short circuit within a
5 bandwidth for said band-stop filter.

1 13. The TM cylindrical shaped microstrip antenna of claim
2 10 wherein said plurality of rectangular shaped antenna
3 elements comprises eight rectangular shape microstrip antenna
4 elements.

1 14. The TM cylindrical shaped microstrip antenna of claim
2 10 wherein said band-stop filter provides said minimum band-
3 stop rejection of 60 decibels at frequencies approximating 1575
4 MHz.

1 15. The TM cylindrical shaped microstrip antenna of claim
2 10 further comprising a plurality of copper plated through
3 holes positioned within said first dielectric layer and a
4 plurality of plated through holes positioned within said second
5 dielectric layer, the copper plated through holes of said first
6 dielectric layer aligning with the copper plated through holes
7 of said second dielectric layer, the copper plated through
8 holes of said first dielectric layer being EM coupled to the
9 copper plated through holes of said second dielectric layer,
10 wherein the copper plated through holes of said first
11 dielectric layer and the copper plated through holes of said
12 second dielectric layer prevent said antenna feed network from
13 becoming coupled to said antenna elements.

1 16. The TM cylindrical shaped microstrip antenna array of
2 claim 10 wherein the copper plated through holes of said first
3 dielectric layer and the copper plated through holes of said
4 second dielectric layer each comprise approximately 270 copper
5 plated through holes.

1 17. A reduced size TM cylindrical shaped microstrip
2 antenna array comprising:

3 (a) a first dielectric layer

4 (b) eight rectangular shaped antenna elements mounted on
5 an upper surface of said first dielectric layer, said
6 eight antenna elements being aligned with one another and
7 fabricated from copper, said eight antenna elements being
8 adapted to transmit RF carrier signals containing telemetry
9 data, said eight antenna elements operating at a TM
10 frequency band of 2200-2300 MHz, resulting in a band width
11 for said TM cylindrical shaped microstrip antenna of 100
12 MHz;

13 (c) a copper cross hatch pattern mounted on the upper
14 surface of said first dielectric layer around a periphery
15 for each of said eight antenna elements wherein a gap
16 forms between first, second and third edges of the
17 periphery of each of said eight antenna elements and said
18 copper cross hatch pattern;

19 (d) an antenna feed network mounted on a bottom surface of
20 said first dielectric layer for connecting each of said
21 eight antenna elements to an antenna feed network input
22 terminal, said antenna feed network including a plurality
23 of transmission lines configured to provide for an equal

transmission line length from said antenna feed network input terminal to each of said eight antenna elements such that the RF carrier signals transmitted by each of said eight antenna elements are in phase and have equal amplitudes, wherein said plurality of transmission lines for said antenna feed network includes a main transmission line connected to said antenna feed network input terminal and a plurality of branch transmission lines, each of said plurality of branch transmission lines having one end thereof connected to one of said eight antenna elements and an opposite end thereof connected to said main transmission line;

(e) a band stop filter integrally formed with said antenna feed network on the bottom surface of said first dielectric layer, said band-stop filter including six L-shaped etched copper open circuit stubs connected to said main transmission line, said band stop filter providing for a minimum band-stop rejection of 60 decibels to isolate said RF carrier signals containing telemetry data from L-Band Radio Frequency signals containing GPS data;

(f) a second dielectric layer positioned below said first dielectric layer in alignment with said first dielectric layer;

(g) a third dielectric layer positioned above said first

48 dielectric layer in alignment with said first dielectric
49 layer, said third dielectric layer functioning as a cover
50 for said TM cylindrical shaped microstrip antenna array;
51 and

52 (h) a solid copper ground plane affixed to a bottom
53 surface of said second dielectric layer.

1 18. The TM cylindrical shaped microstrip antenna of claim
2 17 wherein each of said six etched copper open circuit stubs
3 operating as a short circuit within a bandwidth for said band-
4 stop filter.

1 19. The TM cylindrical shaped microstrip antenna of claim
2 17 further comprising a plurality of copper plated through
3 holes positioned within said first dielectric layer and a
4 plurality of plated through holes positioned within said second
5 dielectric layer, the copper plated through holes of said first
6 dielectric layer aligning with the copper plated through holes
7 of said second dielectric layer, the copper plated through
8 holes of said first dielectric layer being EM coupled to the
9 copper plated through holes of said second dielectric layer,
10 wherein the copper plated through holes of said first
11 dielectric layer and the copper plated through holes of said
12 second dielectric layer prevent said antenna feed network from

13 becoming coupled to said antenna elements.

1 20. The TM cylindrical shaped microstrip antenna array of
2 claim 17 wherein the copper plated through holes of said first
3 dielectric layer and the copper plated through holes of said
4 second dielectric layer each comprise approximately 270 copper
5 plated through holes.